

ATTACHMENT A
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SEQUENCE LISTING

<110> CONNAUGHT LABORATORIES LIMITED
LOOSMORE, Sheena M.
SASAKI, Ken
YANG, Yan-Ping
KLEIN, Michel H.

<120> RECOMBINANT HIGH MOLECULAR WEIGHT MAJOR OUTER MEMBRANE
PROTEIN OF MORAXELLA

<130> 1038-1217 MIS

<140> US 10/031,165

<141> 2002-10-04

<150> US 09/361,619

<151> 1999-07-27

<150> PCT/CA00/00870

<151> 2000-07-26

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<170> PatentIn Ver. 2.1

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gaagtacgca	acttggtggg	tcttggtaat	gctggtaatg	ataacgctga	cggcaatcag	4740
gtaaaccattg	ccgacatcaa	aaaagaccca	aattcagggt	catcatctaa	ccgcactgtc	4800
atcaaagcag	gcacggctact	tggcggtaaa	ggtaataacg	ataccgaaaa	acttgccact	4860
gggtggtatg	aagtgggcgt	ggataaagac	ggcaacgcta	acggcgattt	aagcaatggt	4920
tgggtcaaaa	cccaaaaaga	tggcagcaaa	aaagccctgc	tcgccactta	taacgccgca	4980
ggtcagacca	actatttgac	caacaacccc	gcagaagcca	ttgacagaat	aatgaacaa	5040
ggtatccgct	tcttccatgt	caacgatggc	aatcaagagc	ctgtggtaca	agggcgtaac	5100
ggcattgact	caagtgcctc	aggcaagcac	tcagtggcga	taggtttcca	ggccaaggca	5160
gatggtgaag	ccgccgttgc	cataggcaga	caaaccgaag	caggcaacca	atccatcgcc	5220
atcgggtgata	acgcacaagc	cacgggcgat	caatccatcg	ccatcggtac	aggcaatggt	5280
gtagcaggta	agcactctgg	tgccatcggc	gacccaagca	ctgttaaggc	tgataacagt	5340
tacagtgtgg	gtaataacaa	ccagtttacc	gatgccactc	aaaccgatgt	ctttggtgtg	5400
ggcaataaca	tcaccgtgac	cgaaagtaac	tcggttgcct	taggttcaaa	ctctgccatc	5460
agtgcaggca	cacacgcagg	cacacaagcc	aaaaaatctg	acggcacagc	aggtacaacc	5520
accacgcag	gtgcaaccgg	tacggttaaa	ggctttgctg	gacaaacggc	ggttggtgcg	5580
gtctccgtgg	tgctgacgcg	tgctgacgcg	cgtatccaaa	atgtggcagc	agggtgaggtc	5640
agtgccacca	gcaccgatgc	ggtcaatggt	agccagttgt	acaaagccac	ccaaagcatt	5700
gccaacgcaa	ccaatgagct	tgaccatcgt	atccaccaa	acgaaaataa	ggccaatgca	5760
gggatttcat	cagcgatggc	gatggcgctc	atgccacaag	cctacattcc	tggcagatcc	5820
atggttaccg	ggggatttgc	caccacaaac	ggtcaagggtg	cgggtggcagt	gggactgtcg	5880
aagctgtcgg	ataatgggtca	atgggtatgt	aaaatcaatg	gttcagccga	tacccaaggc	5940
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<211> 1992
<212> PRT
<213> Moraxella catarrhalis

<400> 3
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35 40 45
Asn Ala Gln Gly Gly Gln Ala Ile Ala Ile Gly Ser Ser Asn Lys Thr
50 55 60
Val Asn Gly Ser Ser Leu Asp Lys Ile Gly Thr Asp Ala Thr Gly Gln
65 70 75 80
Glu Ser Ile Ala Ile Gly Gly Asp Val Lys Ala Ser Gly Asp Ala Ser
85 90 95
Ile Ala Ile Gly Ser Asp Asp Leu His Leu Leu Asp Gln His Gly Asn
100 105 110
Pro Lys His Pro Lys Gly Thr Leu Ile Asn Asp Leu Ile Asn Gly His
115 120 125
Ala Val Leu Lys Glu Ile Arg Ser Ser Lys Asp Asn Asp Val Lys Tyr
130 135 140
Arg Arg Thr Thr Ala Ser Gly His Ala Ser Thr Ala Val Gly Ala Met
145 150 155 160
Ser Tyr Ala Gln Gly His Phe Ser Asn Ala Phe Gly Thr Arg Ala Thr
165 170 175
Ala Lys Ser Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala Thr Ala Glu
180 185 190
Gly Gln Ser Thr Ile Ala Ile Gly Ser Asp Ala Thr Ser Ser Ser Leu
195 200 205
Gly Ala Ile Ala Leu Gly Ala Gly Thr Arg Ala Gln Leu Gln Gly Ser
210 215 220
Ile Ala Leu Gly Gln Gly Ser Val Val Thr Gln Ser Asp Asn Asn Ser
225 230 235 240
Arg Pro Ala Tyr Thr Pro Asn Thr Gln Ala Leu Asp Pro Lys Phe Gln
245 250 255
Ala Thr Asn Asn Thr Lys Ala Gly Pro Leu Ser Ile Gly Ser Asn Ser
260 265 270
Ile Lys Arg Lys Ile Ile Asn Val Gly Ala Gly Val Asn Lys Thr Asp
275 280 285
Ala Val Asn Val Ala Gln Leu Glu Ala Val Val Lys Trp Ala Lys Glu
290 295 300
Arg Arg Ile Thr Phe Gln Gly Asp Asp Asn Ser Thr Asp Val Lys Ile
305 310 315 320

Gly Leu Asp Asn Thr Leu Thr Ile Lys Gly Gly Ala Glu Thr Asn Ala
 325 330 335
 Leu Thr Asp Asn Asn Ile Gly Val Val Lys Glu Ala Asp Asn Ser Gly
 340 345 350
 Leu Lys Val Lys Leu Ala Lys Thr Leu Asn Asn Leu Thr Glu Val Asn
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 Thr Thr Thr Leu Asn Ala Thr Thr Thr Val Lys Val Gly Ser Ser Ser
 370 375 380
 Ser Thr Thr Ala Glu Leu Leu Ser Asp Ser Leu Thr Phe Thr Gln Pro
 385 390 395 400
 Asn Thr Gly Ser Gln Ser Thr Ser Lys Thr Val Tyr Gly Val Asn Gly
 405 410 415
 Val Lys Phe Thr Asn Asn Ala Glu Thr Thr Ala Ala Ile Gly Thr Thr
 420 425 430
 Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Arg Asp Gly Asp Val Asp
 435 440 445
 Glu Lys Gln Ala Pro Tyr Leu Asp Lys Lys Gln Leu Lys Val Gly Ser
 450 455 460
 Val Ala Ile Thr Ile Asp Asn Gly Ile Asp Ala Gly Asn Lys Lys Ile
 465 470 475 480
 Ser Asn Leu Ala Lys Gly Ser Ser Ala Asn Asp Ala Val Thr Ile Glu
 485 490 495
 Gln Leu Lys Ala Ala Lys Pro Thr Leu Asn Ala Gly Ala Gly Ile Ser
 500 505 510
 Val Thr Pro Thr Glu Ile Ser Val Asp Ala Lys Ser Gly Asn Val Thr
 515 520 525
 Ala Pro Thr Tyr Asn Ile Gly Val Lys Thr Thr Glu Leu Asn Ser Asp
 530 535 540
 Gly Thr Ser Asp Lys Phe Ser Val Lys Gly Ser Gly Thr Asn Asn Ser
 545 550 555 560
 Leu Val Thr Ala Glu His Leu Ala Ser Tyr Leu Asn Glu Val Asn Arg
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 Thr Ala Asp Ser Ala Leu Gln Ser Phe Thr Val Lys Glu Glu Asp Asp
 580 585 590
 Asp Asp Ala Asn Ala Ile Thr Val Ala Lys Asp Thr Thr Lys Asn Ala
 595 600 605
 Gly Ala Val Ser Ile Leu Lys Leu Lys Gly Lys Asn Gly Leu Thr Val
 610 615 620
 Ala Thr Lys Lys Asp Gly Thr Val Thr Phe Gly Leu Ser Gln Asp Ser
 625 630 635 640
 Gly Leu Thr Ile Gly Lys Ser Thr Leu Asn Asn Asp Gly Leu Thr Val
 645 650 655
 Lys Asp Thr Asn Glu Gln Ile Gln Val Gly Ala Asn Gly Ile Lys Phe
 660 665 670

Thr Asn Val Asn Gly Ser Asn Pro Gly Thr Gly Ile Ala Asn Thr Ala
 675 680 685
 Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Gly Ser Asp Gly Ala Val
 690 695 700
 Asp Thr Asn Lys Pro Tyr Leu Asp Gln Asp Lys Leu Gln Val Gly Asn
 705 710 715 720
 Val Lys Ile Thr Asn Thr Gly Ile Asn Ala Gly Gly Lys Ala Ile Thr
 725 730 735
 Gly Leu Ser Pro Thr Leu Pro Ser Ile Ala Asp Gln Ser Ser Arg Asn
 740 745 750
 Ile Glu Leu Gly Asn Thr Ile Gln Asp Lys Asp Lys Ser Asn Ala Ala
 755 760 765
 Ser Ile Asn Asp Ile Leu Asn Thr Gly Phe Asn Leu Lys Asn Asn Asn
 770 775 780
 Asn Pro Ile Asp Phe Val Ser Thr Tyr Asp Ile Val Asp Phe Ala Asn
 785 790 795 800
 Gly Asn Ala Thr Thr Ala Thr Val Thr His Asp Thr Ala Asn Lys Thr
 805 810 815
 Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile His Leu
 820 825 830
 Thr Gly Thr Asp Asp Asn Lys Lys Leu Gly Val Lys Thr Thr Lys Leu
 835 840 845
 Asn Lys Thr Ser Ala Asn Gly Asn Thr Ala Thr Asn Phe Asn Val Asn
 850 855 860
 Ser Ser Asp Glu Asp Ala Leu Val Asn Ala Lys Asp Ile Ala Glu Asn
 865 870 875 880
 Leu Asn Thr Leu Ala Lys Glu Ile His Thr Thr Lys Gly Thr Ala Asp
 885 890 895
 Thr Ala Leu Gln Thr Phe Thr Val Lys Lys Val Asp Glu Asn Asn Asn
 900 905 910
 Ala Asp Asp Ala Asn Ala Ile Thr Val Gly Gln Lys Asn Ala Asn Asn
 915 920 925
 Gln Val Asn Thr Leu Thr Leu Lys Gly Glu Asn Gly Leu Asn Ile Lys
 930 935 940
 Thr Asp Lys Asn Gly Thr Val Thr Phe Gly Ile Asn Thr Thr Ser Gly
 945 950 955 960
 Leu Lys Ala Gly Lys Ser Thr Leu Asn Asp Gly Gly Leu Ser Ile Lys
 965 970 975
 Asn Pro Thr Gly Ser Glu Gln Ile Gln Val Gly Ala Asp Gly Val Lys
 980 985 990
 Phe Ala Lys Val Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly
 995 1000 1005
 Thr Thr Arg Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly

1010	1015	1020
Ser Leu Asp Lys Ser Lys	Pro His Leu Ser Lys	Asp Gly Ile Asn Ala
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Gly Gly Lys Lys Ile Thr	Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn	
	1045	1050 1055
Ser His Asp Ala Val Thr	Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu	
	1060	1065 1070
Leu Glu Asn Lys Ile Ser Ser	Thr Ala Lys Thr Ala Gln Asn Ser Leu	
	1075	1080 1085
His Glu Phe Ser Val Ala Asp	Glu Gln Gly Asn Asn Phe Thr Val Ser	
	1090	1095 1100
Asn Pro Tyr Ser Ser Tyr	Asp Thr Ser Lys Thr Ser Asp Val Ile Thr	
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Phe Ala Gly Glu Asn Gly	Ile Thr Thr Lys Val Asn Lys Gly Val Val	
	1125	1130 1135
Arg Val Gly Ile Asp Gln	Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr	
	1140	1145 1150
Val Gly Asn Asn Asn Gly	Lys Gly Ile Val Ile Asp Ser Gln Asn Gly	
	1155	1160 1165
Gln Asn Thr Ile Thr Gly	Leu Ser Asn Thr Leu Ala Asn Val Thr Asn	
	1170	1175 1180
Asp Lys Gly Ser Val Arg	Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp	
	1185	1190 1195 1200
Glu Asp Lys Thr Arg Ala	Ala Ser Ile Val Asp Val Leu Ser Ala Gly	
	1205	1210 1215
Phe Asn Leu Gln Gly Asn	Gly Glu Ala Val Asp Phe Val Ser Thr Tyr	
	1220	1225 1230
Asp Thr Val Asn Phe Ala	Asp Gly Asn Ala Thr Thr Ala Lys Val Thr	
	1235	1240 1245
Tyr Asp Asp Thr Ser Lys	Thr Ser Lys Val Val Tyr Asp Val Asn Val	
	1250	1255 1260
Asp Asp Thr Thr Ile Glu	Val Lys Asp Lys Lys Leu Gly Val Lys Thr	
	1265	1270 1275 1280
Thr Thr Leu Thr Ser Thr	Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser	
	1285	1290 1295
Asn Gln Ala Thr Gly Asp	Ala Leu Val Lys Ala Ser Asp Ile Val Ala	
	1300	1305 1310
His Leu Asn Thr Leu Ser	Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser	
	1315	1320 1325
Gln Ala Asn Asn Ser Ala	Gly Tyr Val Asp Ala Asp Gly Asn Lys Val	
	1330	1335 1340
Ile Tyr Asp Ser Thr Asp	Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly	
	1345	1350 1355 1360

Thr Val Asp Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln
 1365 1370 1375
 Ala Gln Thr Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val
 1380 1385 1390
 Ile Asn Lys Glu Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn
 1395 1400 1405
 Glu Asp Asn Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn
 1410 1415 1420
 Lys Thr Lys Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala
 1425 1430 1435 1440
 Gln Thr Pro Leu Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys
 1445 1450 1455
 Leu Gly Glu Thr Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys
 1460 1465 1470
 Leu Thr Asp Asn Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr
 1475 1480 1485
 Val Lys Leu Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly
 1490 1495 1500
 Gly Thr Lys Ile Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly
 1505 1510 1515 1520
 Gln Ala Lys Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu
 1525 1530 1535
 Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp
 1540 1545 1550
 Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu
 1555 1560 1565
 Gly Asn Ala Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala
 1570 1575 1580
 Asp Ile Lys Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val
 1585 1590 1595 1600
 Ile Lys Ala Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu
 1605 1610 1615
 Lys Leu Ala Thr Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn
 1620 1625 1630
 Ala Asn Gly Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly
 1635 1640 1645
 Ser Lys Lys Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn
 1650 1655 1660
 Tyr Leu Thr Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln
 1665 1670 1675 1680
 Gly Ile Arg Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val
 1685 1690 1695
 Gln Gly Arg Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val
 1700 1705 1710

Ala Ile Gly Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile
 1715 1720 1725
 Gly Arg Gln Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn
 1730 1735 1740
 Ala Gln Ala Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val
 1745 1750 1755 1760
 Val Ala Gly Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys
 1765 1770 1775
 Ala Asp Asn Ser Tyr Ser Val Gly Asn Asn Asn Gln Phe Thr Asp Ala
 1780 1785 1790
 Thr Gln Thr Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu
 1795 1800 1805
 Ser Asn Ser Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr
 1810 1815 1820
 His Ala Gly Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr
 1825 1830 1835 1840
 Thr Thr Ala Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr
 1845 1850 1855
 Ala Val Gly Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile
 1860 1865 1870
 Gln Asn Val Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val
 1875 1880 1885
 Asn Gly Ser Gln Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr
 1890 1895 1900
 Asn Glu Leu Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala
 1905 1910 1915 1920
 Gly Ile Ser Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile
 1925 1930 1935
 Pro Gly Arg Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln
 1940 1945 1950
 Gly Ala Val Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp
 1955 1960 1965
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 Ala Val Gly Ala Gly Phe His Phe
 1985 1990

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 <212> PRT
 <213> Moraxella catarrhalis

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 Cys Ala Thr Gly Gln Val Gly Ser Val Cys Thr Leu Ser Phe Ala Arg
 35 40 45
 Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr Leu Ser Gly Ser
 50 55 60
 Ala Tyr Ala Gln Lys Lys Asp Thr Lys His Ile Ala Ile Gly Glu Gln
 65 70 75 80
 Asn Gln Pro Arg Arg Ser Gly Thr Ala Lys Ala Asp Gly Asp Arg Ala
 85 90 95
 Ile Ala Ile Gly Glu Asn Ala Asn Ala Gln Gly Gly Gln Ala Ile Ala
 100 105 110
 Ile Gly Ser Ser Asn Lys Thr Val Asn Gly Ser Ser Leu Asp Lys Ile
 115 120 125
 Gly Thr Asp Ala Thr Gly Gln Glu Ser Ile Ala Ile Gly Gly Asp Val
 130 135 140
 Lys Ala Ser Gly Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu His
 145 150 155 160
 Leu Leu Asp Gln His Gly Asn Pro Lys His Pro Lys Gly Thr Leu Ile
 165 170 175
 Asn Asp Leu Ile Asn Gly His Ala Val Leu Lys Glu Ile Arg Ser Ser
 180 185 190
 Lys Asp Asn Asp Val Lys Tyr Arg Arg Thr Thr Ala Ser Gly His Ala
 195 200 205
 Ser Thr Ala Val Gly Ala Met Ser Tyr Ala Gln Gly His Phe Ser Asn
 210 215 220
 Ala Phe Gly Thr Arg Ala Thr Ala Lys Ser Ala Tyr Ser Leu Ala Val
 225 230 235 240
 Gly Leu Ala Ala Thr Ala Glu Gly Gln Ser Thr Ile Ala Ile Gly Ser
 245 250 255
 Asp Ala Thr Ser Ser Ser Leu Gly Ala Ile Ala Leu Gly Ala Gly Thr
 260 265 270
 Arg Ala Gln Leu Gln Gly Ser Ile Ala Leu Gly Gln Gly Ser Val Val
 275 280 285
 Thr Gln Ser Asp Asn Asn Ser Arg Pro Ala Tyr Thr Pro Asn Thr Gln
 290 295 300
 Ala Leu Asp Pro Lys Phe Gln Ala Thr Asn Asn Thr Lys Ala Gly Pro
 305 310 315 320
 Leu Ser Ile Gly Ser Asn Ser Ile Lys Arg Lys Ile Ile Asn Val Gly
 325 330 335
 Ala Gly Val Asn Lys Thr Asp Ala Val Asn Val Ala Gln Leu Glu Ala
 340 345 350
 Val Val Lys Trp Ala Lys Glu Arg Arg Ile Thr Phe Gln Gly Asp Asp
 355 360 365

Asn	Ser	Thr	Asp	Val	Lys	Ile	Gly	Leu	Asp	Asn	Thr	Leu	Thr	Ile	Lys
	370					375					380				
Gly	Gly	Ala	Glu	Thr	Asn	Ala	Leu	Thr	Asp	Asn	Asn	Ile	Gly	Val	Val
385					390					395					400
Lys	Glu	Ala	Asp	Asn	Ser	Gly	Leu	Lys	Val	Lys	Leu	Ala	Lys	Thr	Leu
				405					410					415	
Asn	Asn	Leu	Thr	Glu	Val	Asn	Thr	Thr	Thr	Leu	Asn	Ala	Thr	Thr	Thr
			420					425					430		
Val	Lys	Val	Gly	Ser	Ser	Ser	Ser	Thr	Thr	Ala	Glu	Leu	Leu	Ser	Asp
		435					440					445			
Ser	Leu	Thr	Phe	Thr	Gln	Pro	Asn	Thr	Gly	Ser	Gln	Ser	Thr	Ser	Lys
	450					455					460				
Thr	Val	Tyr	Gly	Val	Asn	Gly	Val	Lys	Phe	Thr	Asn	Asn	Ala	Glu	Thr
465					470					475					480
Thr	Ala	Ala	Ile	Gly	Thr	Thr	Arg	Ile	Thr	Arg	Asp	Lys	Ile	Gly	Phe
				485					490					495	
Ala	Arg	Asp	Gly	Asp	Val	Asp	Glu	Lys	Gln	Ala	Pro	Tyr	Leu	Asp	Lys
			500					505					510		
Lys	Gln	Leu	Lys	Val	Gly	Ser	Val	Ala	Ile	Thr	Ile	Asp	Asn	Gly	Ile
		515					520					525			
Asp	Ala	Gly	Asn	Lys	Lys	Ile	Ser	Asn	Leu	Ala	Lys	Gly	Ser	Ser	Ala
	530					535					540				
Asn	Asp	Ala	Val	Thr	Ile	Glu	Gln	Leu	Lys	Ala	Ala	Lys	Pro	Thr	Leu
545					550					555					560
Asn	Ala	Gly	Ala	Gly	Ile	Ser	Val	Thr	Pro	Thr	Glu	Ile	Ser	Val	Asp
				565					570					575	
Ala	Lys	Ser	Gly	Asn	Val	Thr	Ala	Pro	Thr	Tyr	Asn	Ile	Gly	Val	Lys
			580					585					590		
Thr	Thr	Glu	Leu	Asn	Ser	Asp	Gly	Thr	Ser	Asp	Lys	Phe	Ser	Val	Lys
		595					600					605			
Gly	Ser	Gly	Thr	Asn	Asn	Ser	Leu	Val	Thr	Ala	Glu	His	Leu	Ala	Ser
	610					615					620				
Tyr	Leu	Asn	Glu	Val	Asn	Arg	Thr	Ala	Asp	Ser	Ala	Leu	Gln	Ser	Phe
625					630					635					640
Thr	Val	Lys	Glu	Glu	Asp	Asp	Asp	Asp	Ala	Asn	Ala	Ile	Thr	Val	Ala
				645					650					655	
Lys	Asp	Thr	Thr	Lys	Asn	Ala	Gly	Ala	Val	Ser	Ile	Leu	Lys	Leu	Lys
			660					665					670		
Gly	Lys	Asn	Gly	Leu	Thr	Val	Ala	Thr	Lys	Lys	Asp	Gly	Thr	Val	Thr
		675					680					685			
Phe	Gly	Leu	Ser	Gln	Asp	Ser	Gly	Leu	Thr	Ile	Gly	Lys	Ser	Thr	Leu
	690					695					700				
Asn	Asn	Asp	Gly	Leu	Thr	Val	Lys	Asp	Thr	Asn	Glu	Gln	Ile	Gln	Val

705		710		715		720
Gly Ala Asn Gly	Ile Lys Phe Thr Asn Val	Asn Gly Ser Asn Pro Gly				
	725		730			735
Thr Gly Ile Ala	Asn Thr Ala Arg Ile Thr Arg Asp Lys Ile Gly Phe					
	740		745			750
Ala Gly Ser Asp Gly Ala Val Asp Thr Asn Lys Pro Tyr Leu Asp Gln						
	755		760			765
Asp Lys Leu Gln Val Gly Asn Val Lys Ile Thr Asn Thr Gly Ile Asn						
	770		775			780
Ala Gly Gly Lys Ala Ile Thr Gly Leu Ser Pro Thr Leu Pro Ser Ile						
	785		790			795
Ala Asp Gln Ser Ser Arg Asn Ile Glu Leu Gly Asn Thr Ile Gln Asp						
	805		810			815
Lys Asp Lys Ser Asn Ala Ala Ser Ile Asn Asp Ile Leu Asn Thr Gly						
	820		825			830
Phe Asn Leu Lys Asn Asn Asn Asn Pro Ile Asp Phe Val Ser Thr Tyr						
	835		840			845
Asp Ile Val Asp Phe Ala Asn Gly Asn Ala Thr Thr Ala Thr Val Thr						
	850		855			860
His Asp Thr Ala Asn Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val						
	865		870			875
Asp Asp Thr Thr Ile His Leu Thr Gly Thr Asp Asp Asn Lys Lys Leu						
	885		890			895
Gly Val Lys Thr Thr Lys Leu Asn Lys Thr Ser Ala Asn Gly Asn Thr						
	900		905			910
Ala Thr Asn Phe Asn Val Asn Ser Ser Asp Glu Asp Ala Leu Val Asn						
	915		920			925
Ala Lys Asp Ile Ala Glu Asn Leu Asn Thr Leu Ala Lys Glu Ile His						
	930		935			940
Thr Thr Lys Gly Thr Ala Asp Thr Ala Leu Gln Thr Phe Thr Val Lys						
	945		950			955
Lys Val Asp Glu Asn Asn Ala Asp Asp Ala Asn Ala Ile Thr Val						
	965		970			975
Gly Gln Lys Asn Ala Asn Asn Gln Val Asn Thr Leu Thr Leu Lys Gly						
	980		985			990
Glu Asn Gly Leu Asn Ile Lys Thr Asp Lys Asn Gly Thr Val Thr Phe						
	995		1000			1005
Gly Ile Asn Thr Thr Ser Gly Leu Lys Ala Gly Lys Ser Thr Leu Asn						
	1010		1015			1020
Asp Gly Gly Leu Ser Ile Lys Asn Pro Thr Gly Ser Glu Gln Ile Gln						
	1025		1030			1035
Val Gly Ala Asp Gly Val Lys Phe Ala Lys Val Asn Asn Asn Gly Val						
	1045		1050			1055

Val Gly Ala Gly Ile Asp Gly Thr Thr Arg Ile Thr Arg Asp Glu Ile
 1060 1065 1070
 Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp Lys Ser Lys Pro His Leu
 1075 1080 1085
 Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys Lys Ile Thr Asn Ile Gln
 1090 1095 1100
 Ser Gly Glu Ile Ala Gln Asn Ser His Asp Ala Val Thr Gly Gly Lys
 1105 1110 1115 1120
 Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys Ile Ser Ser Thr Ala
 1125 1130 1135
 Lys Thr Ala Gln Asn Ser Leu His Glu Phe Ser Val Ala Asp Glu Gln
 1140 1145 1150
 Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr Ser Ser Tyr Asp Thr Ser
 1155 1160 1165
 Lys Thr Ser Asp Val Ile Thr Phe Ala Gly Glu Asn Gly Ile Thr Thr
 1170 1175 1180
 Lys Val Asn Lys Gly Val Val Arg Val Gly Ile Asp Gln Thr Lys Gly
 1185 1190 1195 1200
 Leu Thr Thr Pro Lys Leu Thr Val Gly Asn Asn Asn Gly Lys Gly Ile
 1205 1210 1215
 Val Ile Asp Ser Gln Asn Gly Gln Asn Thr Ile Thr Gly Leu Ser Asn
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 Thr Leu Ala Asn Val Thr Asn Asp Lys Gly Ser Val Arg Thr Thr Glu
 1235 1240 1245
 Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys Thr Arg Ala Ala Ser Ile
 1250 1255 1260
 Val Asp Val Leu Ser Ala Gly Phe Asn Leu Gln Gly Asn Gly Glu Ala
 1265 1270 1275 1280
 Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn Phe Ala Asp Gly Asn
 1285 1290 1295
 Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr Ser Lys Thr Ser Lys
 1300 1305 1310
 Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile Glu Val Lys Asp
 1315 1320 1325
 Lys Lys Leu Gly Val Lys Thr Thr Thr Leu Thr Ser Thr Gly Thr Gly
 1330 1335 1340
 Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala Thr Gly Asp Ala Leu Val
 1345 1350 1355 1360
 Lys Ala Ser Asp Ile Val Ala His Leu Asn Thr Leu Ser Gly Asp Ile
 1365 1370 1375
 Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn Asn Ser Ala Gly Tyr Val
 1380 1385 1390
 Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser Thr Asp Asn Lys Tyr
 1395 1400 1405

Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys Thr Lys Glu Val Ala
 1410 1415 1420
 Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro Asp Gly Thr Leu Ala
 1425 1430 1435 1440
 Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu Gln Val Asn Asp Ala
 1445 1450 1455
 Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala Phe Val Lys Gly Leu
 1460 1465 1470
 Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys Asn Ala Ala Val Thr Val
 1475 1480 1485
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<213> Moraxella catarrhalis

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Ala	Tyr	Ala	Gln	Gln	Ile	Thr	Thr	Lys	Ile	Glu	Ile	Gly	Gln	Thr	Asn
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Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln Gly Ala Val
2005 2010 2015

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Ala Ile Gly 1715	Phe Gln Ala Lys Ala Asp Gly Glu 1720	Ala Ala Val Ala Ile 1725
Gly Arg Gln 1730	Thr Gln Ala Gly Asn Gln Ser Ile 1735	Ala Ile Gly Asp Asn 1740
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 Gly Asp Ala₃₅₅ Leu Val Lys Ala Ser₃₆₀ Asp Ile Val Ala His₃₆₅ Leu Asn Thr
 Leu Ser₃₇₀ Gly Asp Ile Gln Thr₃₇₅ Ala Lys Gly Ala Ser₃₈₀ Gln Ala Asn Asn
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<211> 816

<212> PRT

<213> Moraxella catarrhalis

<400> 48

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 35 40 45
 Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly Thr Thr Arg Ile
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 Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp Lys
 65 70 75 80
 Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys Lys
 85 90 95
 Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn Ser His Asp Ala
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 Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys
 115 120 125
 Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu His Glu Phe Ser
 130 135 140
 Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr Ser
 145 150 155 160
 Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr Phe Ala Gly Glu
 165 170 175
 Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val Arg Val Gly Ile
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 Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr Val Gly Asn Asn
 195 200 205
 Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly Gln Asn Thr Ile
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 Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn Asp Lys Gly Ser
 225 230 235 240
 Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys Thr
 245 250 255
 Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly Phe Asn Leu Gln
 260 265 270
 Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn
 275 280 285
 Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr
 290 295 300
 Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr
 305 310 315 320
 Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr Thr Thr Leu Thr
 325 330 335
 Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala Thr
 340 345 350

Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala His Leu Asn Thr
 355 360 365
 Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn Asn
 370 375 380
 Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser
 385 390 395 400
 Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys
 405 410 415
 Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro
 420 425 430
 Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu
 435 440 445
 Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala
 450 455 460
 Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys Asn
 465 470 475 480
 Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu
 485 490 495
 Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr
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 Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn
 515 520 525
 Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala
 530 535 540
 Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly Gly Thr Lys Ile
 545 550 555 560
 Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly Gln Ala Lys Ala
 565 570 575
 Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Val
 580 585 590
 Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn Val
 595 600 605
 Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu Gly Asn Ala Gly
 610 615 620
 Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala Asp Ile Lys Lys
 625 630 635 640
 Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val Ile Lys Ala Gly
 645 650 655
 Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala Thr
 660 665 670
 Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn Ala Asn Gly Asp
 675 680 685
 Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala

690		695		700
Leu 705	Leu Ala Thr Tyr	Asn 710	Ala Ala Gly Gln Thr	Asn 720
Asn	Pro Ala Glu 725	Ile Asp Arg Ile	Asn 730	Glu Gln Gly Ile Arg 735
Phe	His Val 740	Asn Asp Gly Asn Gln	Glu 745	Pro Val Val Gln Gly Arg Asn 750
Gly Ile 755	Asp Ser Ser Ala Ser	Gly 760	Lys His Ser Val	Ala 765
Gln 770	Ala Lys Ala Asp Gly	Glu 775	Ala Ala Val Ala	Ile 780
Gln 785	Ala Gly Asn Gln Ser 790	Ile Ala Ile Gly	Asp 795	Asn Ala Gln Ala Thr 800
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 <213> Moraxella catarrhalis

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 <212> PRT
 <213> Moraxella catarrhalis

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<210> 51
 <211> 5

<212> PRT

<213> Moraxella cattarhalis

<400> 51

Val Val Ala Gly Lys
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